1. A method comprising:

imaging test light emerging from a test object over a range of angles to interfere with reference light on a detector, wherein the test and reference light are derived from a common source;

for each of the angles, simultaneously varying an optical path length difference from the source to the detector between interfering portions of the test and reference light at a rate that depends on the angle at which the test light emerges from the test object; and

determining an angle-dependence of an optical property of the test object based on the interference between the test and reference light as the optical path length difference is varied for each of the angles.

2. The method of claim 1, wherein the detector is a camera having multiple detector elements and the imaging comprises imaging the test light emerging from different locations of the test object to corresponding locations on the camera.

3. The method of claim 2, wherein determining the angle-dependence of the optical property comprises determining the angle-dependence of the optical property at each of the different locations of the test object.

4. The method of claim 1, wherein the angle-dependence of the optical property relate to changes in the optical property as a function of angle of the test light incident on the test object.

5. The method of claim 4, further comprises illuminating multiple locations of the test object with the test light such that the test light is incident on each of the multiple locations over the range of incident angles.

6. The method of claim 5, wherein the illuminating and the imaging involve a common objective lens.

7. The method of claim 5, wherein the common source is a spatially extended source.

8. The method of claim 5, wherein the range of incident angles corresponds to a numerical aperture greater than 0.7.

9. The method of claim 5, wherein the range of incident angles corresponds to a numerical aperture greater than 0.9.

10. The method of claim 1, wherein the angle-dependence of the optical property relate to changes in the optical property as a function of angle of the test light scattered from the test object.

11. The method of claim 10, further comprising illuminating multiple locations of the test object with the test light having a uniform angle of incidence on the test object, and wherein the imaging comprises imaging test light scattered over a range of angles from each location of the test object to a corresponding location on the detector.

12. The method of claim 11, wherein the illuminating and the imaging involve a common objective lens.

13. The method of claim 11, wherein the common source is a point source.

14. The method of claim 11, wherein the range of incident angles corresponds to a numerical aperture greater than 0.7.

15. The method of claim 11, wherein the range of incident angles corresponds to a numerical aperture greater than 0.9.

16. The method of claim 1, wherein the imaging further comprises polarizing the test light in a pupil plane of an optical system involved in the imaging.

17. The method of claim 1, further comprising illuminating the test object with the test light and polarizing the test light in a pupil plane of an optical system used to illuminate the test object.

18. The method of claim 1, wherein the common source is monochromatic.

19. The method of claim 18, wherein the common source has a central wavelength and a spectral bandwidth less than 2% of the central wavelength.

20. The method of claim 1, wherein the simultaneous varying of the optical path length difference for each of the angles comprises moving the test object relative to an objective used to collect the test light emerging from the test sample.

21. The method of claim 1, wherein the simultaneous varying of the optical path length difference for each of the angles comprises moving a reference mirror used to reflect the reference light relative to an objective used to focus the reference light onto the reference mirror.

22. The method of claim 1, wherein the simultaneous varying of the optical path length difference for each of the angles comprises moving a beam splitter positioned within a Mirau interference objective.

23. The method of claim 1, wherein the simultaneous varying of the optical path length difference for each of the angles defines a spatial coherence length, and wherein the optical path length difference for at least one of the angles is varied over a range larger than the spatial coherence length.

24. The method of claim 1, wherein determining the angle-dependence of the optical property comprises:

measuring an interference signal from the detector as the optical path length difference is simultaneously varied for each of the angles; and

transforming the interference signal with respect to a coordinate linearly proportional the optical path length difference for each of the angles to produce a transformed signal that depends on a conjugate variable to the coordinate.

25. The method of claim 24, wherein the conjugate variable is spatial frequency.

26. The method of claim 24, wherein the conjugate variable provides a direct mapping to the angle of test light incident on, or emerging from, the test object.

27. The method of claim 26, wherein the conjugate variable is spatial frequency $K$ and the direct mapping between the spatial frequency and the angle $\phi$ is given by $K(\phi) \propto \cos(\phi)/\lambda$, where $\lambda$ is the wavelength of the test light.

28. The method of claim 27, wherein the direct mapping between the spatial frequency and the angle is given by $K(\phi) = 4\pi\cos(\phi)/\lambda$.

29. The method of claim 24, wherein the transformed signal provides a direct mapping to the angle-dependence of the optical property.

30. The method of claim 24, wherein the transformation corresponds to a Fourier transform.

31. The method of claim 1, wherein the optical property is related to the complex reflectivity of the test object.

32. The method of claim 31, wherein the optical property is related to the magnitude of the complex reflectivity of the test object.

33. The method of claim 31, wherein the optical property is related to the phase of the complex reflectivity of the test object.

34. The method of claim 1, wherein the angle-dependence of the optical property is determined based on the interference between the test and reference light as the optical path length difference is varied for each of the angles and precalibrated angle-dependent characteristics of an optical system involved in the imaging.

35. The method of claim 1, further comprising determining a surface height profile of the test object based on the interference between the test and reference light as the optical path length difference is varied.

36. The method of claim 1, further comprising comparing the angle-dependent changes in the optical property determined from the interference between the test and reference light to those of a model for the test object.

37. The method of claim 36, wherein the test object comprises at least one thin film on a substrate.

38. The method of claim 37, further comprising determining a thickness of the thin film based on the comparison.

39. The method of claim 38, wherein the optical property comprises the magnitude of the angle-dependence of the complex reflexity of the test sample, and the determination of the thickness of the thin film is based on comparing the magnitude of the angle-dependence of the complex reflexity to that of the model.

40. The method of claim 39, further comprising determining a surface height profile for the test object based on the comparison.

41. The method of claim 40, wherein the optical property further comprises the phase of the angle-dependence of the complex reflexity of the test sample, and the determination of the surface height profile is based on the determined thickness of the thin film and comparing the phase of the angle-dependence of the complex reflexity to that of the model for the determined thickness.

42. The method of claim 1, wherein the test and reference light have a first wavelength, and wherein the method further comprises repeating the imaging, varying, and determining for test and reference light having a second wavelength different from the first wavelength.

43. A method comprising:

imaging test light emerging from a test object over a range of angles to interfere with reference light on a detector, wherein the test and reference light are derived from a monochromatic, common source and wherein the test object comprises at least one thin film on a substrate;

for each of the angles, simultaneously varying an optical path length difference from the source to the detector between interfering portions of the test and reference light at a rate that depends on the angle at which the test light emerges from the test object; and

determining a thickness of the thin film based on the interference between the test and reference light as the optical path length difference is varied for each of the angles.

44. A method comprising:

determining an angle-dependence of an optical property of a test object based on scanning interferometry data for the test object.

45. A method comprising:

determining a thickness of a thin film on a test object comprising the thin film and a substrate supporting the thin film based on monochromatic scanning interferometry data for the test object.

46. An apparatus comprising:

a light source;

a detector;

a scanning interferometer configured to image test light emerging from a test object over a range of angles to interfere with reference light on the detector, wherein the test and reference light are derived from the light source,

wherein for each of the angles, the scanning interferometer is further configured to simultaneously vary an optical path length difference from the source to the detector between interfering portions of the test and reference light at a rate that depends on the angle at which the test light emerges from the test object; and

an electronic processor coupled to the detector and the scanning interferometer, wherein the electronic processor is configured to determine an angle-dependence of an optical property of the test object based on the interference between the test and reference light as the optical path length difference is varied for each of the angles as measured by the detector.

47. An apparatus comprising:

a monochromatic light source;

a detector;

a scanning interferometer configured to image test light emerging from a test object over a range of angles to interfere with reference light on the detector, wherein the test and reference light are derived from the monochromatic light source,

wherein for each of the angles, the scanning interferometer is further configured to simultaneously vary an optical path length difference from the source to the detector between interfering portions of the test and reference light at a rate that depends on the angle at which the test light emerges from the test object; and

an electronic processor coupled to the detector and the scanning interferometer, wherein the electronic processor is configured to determine a thickness of a thin film on the test object based on the interference between the test and reference light as the optical path length difference is varied for each of the angles.

48. Apparatus comprising:

a scanning interferometry system; and

an electronic processor coupled to the scanning interferometry system, wherein the electronic processor is configured to determine an angle-dependence of an optical property of a test object based on scanning interferometry data for the test object produced by the scanning interferometry system.

49. Apparatus comprising:

a monochromatic scanning interferometry system; and

an electronic processor coupled to the scanning interferometry system, wherein the electronic processor is configured to determine a thickness of a thin film on the test object based on monochromatic scanning interferometry data for the test object.

50. An apparatus comprising:

a scanning interferometer configured to image test light emerging from a test object over a range of angles to interfere with reference light on a detector, wherein the test and reference light are derived from a common source,

wherein for each of the angles, the scanning interferometer is further configured to simultaneously vary an optical path length difference from the source to the detector between interfering portions of the test and reference light at a rate that depends on the angle at which the test light emerges from the test object,

wherein the interferometer comprises an objective lens positioned to collect the test light emerging from the test object and at least one polarization optic positioned in a pupil plane of the objective.

51. The apparatus of claim 50, wherein the at least one polarization optic imparts a polarization that varies across the pupil plane.

52. The apparatus of claim 50, wherein the at least one polarization optic comprises a polarizer and at least one waveplate.

53. The apparatus of claim 52, wherein the at least one polarization optic comprises two waveplates located a different positions in the pupil plane.

54. An apparatus comprising:

a scanning interferometer configured to image test light emerging from a test object over a range of angles to interfere with reference light on a detector, wherein the test and reference light are derived from a common source,

wherein for each of the angles, the scanning interferometer is further configured to simultaneously vary an optical path length difference from the source to the detector between interfering portions of the test and reference light at a rate that depends on the angle at which the test light emerges from the test object,

wherein the interferometer comprises a source module configured to illuminate the test object with substantially collimated light.

55. The apparatus of claim 54, further comprising the common source, wherein the common source is a monochromatic source.